REMARKS

Claim 1 has been amended.

The Examiner has objected to claim 1 because the recitation "wherein" in the limitations "wherein the image sensing element having a photoelectric conversion region" and "wherein the OB clamping circuit having a switch" is superfluous and should be omitted. Applicant has amended claim 1, as suggested by the Examiner, to delete the recitation "wherein" from these limitations, thereby obviating the Examiner's objection.

The Examiner has also objected to claim 1 because the limitation "a photoelectric conversion region which generates and storing signal charges of an object" should be "a photoelectric conversion region which generates and stores signal charges of an object." Applicant has amended claim 1, as suggested by the Examiner, thereby obviating the Examiner's objection.

The Examiner has further objected to claim 1 because the limitation "by shielding a part of the photoelectric conversion elements from light" makes it sound like half of a photoelectric conversion element is shielded. Applicant respectfully disagrees with the Examiner's argument and believes that this limitation clearly recites that only a part of the photoelectric conversion elements, and not all of the photoelectric conversion elements, are shielded from light. This limitation is further supported by Fig. 1 of applicant's drawings which show a part of the photoelectric conversion element, namely four out of sixteen columns in this embodiment, being shielded from light. Applicant therefore believes that the Examiner's objection has been overcome.

The Examiner has rejected claims 1-5 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which

applicant regards as the invention. The Examiner has argued that the limitation "the charge detection portion" in line 20 of claim 1 lacks antecedent basis and that it is unclear if the photoelectric conversion portion is different form the photoelectric conversion region recited earlier in the claim. Applicant respectfully disagrees with the Examiner and believes that antecedent basis for this limitation is provided on line 12 of applicant's claim 1, which recites "a charge detection portion which converts the signal charges transferred from the horizontal transfer portion into a signal voltage."

The Examiner has also argued that the limitation "the photoelectric conversion portion" in line 21 of claim 1 lacks antecedent basis and that it is unclear whether this limitation refers to the photoelectric conversion portion recited earlier in the claim. Applicant has amended all recitations of "the photoelectric conversion portion" in claim 1 to recite "the photoelectric conversion region" so as to make this recitation consistent throughout the claim. Applicant therefore believes that there is sufficient antecedent basis for the recitation "the photoelectric conversion region" in claim 1.

The Examiner has argued that the recitation that the clamping operation of the OB clamping circuit is continued while the signal charges are stored in the photoelectric conversion portion and no transfer pulses are being supplied to the horizontal transfer portion as recited in claim 1 is confusing. Specifically, the Examines has argued that this limitation is confusing because it seems from the claim that the clamping operation of the OB clamping circuit consists of clamping an OB signal output from the optical black region to a reference voltage, and if there are no horizontal transfer pulses, then no values can be read into the OB clamping circuit and it could not perform the clamping function. Applicant respectfully disagrees with the Examiner's argument. Specifically, the OB clamping, as defined in claim 1, is continued during

the storage period specifically to clamp an input voltage corresponding to the floating diffusion amplifier after it has been reset and in the absence of dark current. Therefore, applicant believes that the "OB clamping circuit" is clearly recited and distinctly claimed in applicant's claim 1.

The Examiner has also argued that the limitation "the unnecessary charges" as recited in dependent claim 2-5 lacks antecedent basis. Applicant has amended independent claim 1, from which claims 2-5 depend, to recite "a horizontal drain portion which drains unnecessary charges overflowing from the horizontal transfer portion" so as to provide sufficient antecedent basis to the limitation "the unnecessary charges" in claims 2-5.

Based on the above, applicant believes that claims 1-5 particularly point out and distinctly claim the subject matter which applicant regards as the invention, and are in compliance with 35 USC 112, second paragraph. The Examiner's rejections are therefore respectfully traversed.

The Examiner has rejected claims 1 and 3-5 under 35 U.S.C. 103(a) as being unpatentable over Wako (US Patent 7,050,101) in view of Funakoshi (US Publ. 2001/0055068). The Examiner has also rejected claim 2 under 35 U.S.C. 103(a) as being unpatentable over Wako in view of Funakoshi and further in view of Kondo (US Patent 6,476,941). Applicant has amended independent claim 1 and with respect to this claim, as amended, and its dependent claims, the Examiner's rejection is respectfully traversed.

Applicant has amended independent claim 1 to recite an image sensing apparatus comprising: an image sensing element at which a plurality of photoelectric conversion elements are two-dimensionally arrayed, the image sensing element having a photoelectric conversion region which generates and stores signal charges of an object, an optical black region which

outputs an optical black signal by shielding a part of the photoelectric conversion elements from light, a vertical transfer portion which vertically transfers the signal charges stored in the photoelectric conversion region in accordance with a vertical transfer pulse, a horizontal transfer portion which horizontally transfers the signal charges transferred from the vertical transfer portion in accordance with a horizontal transfer pulse, a horizontal drain portion which drains unnecessary charges overflowing from the horizontal transfer portion, and a charge detection portion which converts the signal charges transferred from the horizontal transfer portion into a signal voltage, and an OB clamping circuit which clamps the optical black signal output from the optical black region to a reference voltage, the OB clamping circuit having a switch which inputs the reference voltage from a reference power supply, and a capacitor, wherein the image sensing element is configured in such a way that the vertical transfer portion is driven with high-speed by providing the vertical transfer pulse and the unnecessary charges generated in the vertical transfer portion are transferred to the horizontal transfer portion, providing the horizontal transfer pulse to the horizontal transfer portion is stopped, and resetting operation of the charge detection portion and clamping operation of the OB clamping circuit are continued while the signal charges are stored in the photoelectric conversion region.

The construction recited in applicant's amended independent claim 1 is not taught or suggested by the cited art. More particularly, the Wako patent and the Funakoshi publication do not teach or suggest that the vertical transfer portion is driven with high-speed by providing that the vertical transfer pulse and the unnecessary charges generated in the vertical transfer portion are transferred to the horizontal transfer portion, providing the horizontal transfer pulse to the horizontal transfer portion is stopped, and the resetting operation of the charge detection portion and the clamping operation of the OB clamping circuit are continued while the signal

charges are stored in the photoelectric conversion region as recited in amended independent claim 1.

The Examiner has acknowledged that Wako does not disclose either an OB clamping circuit or that when the horizontal transfer pulse to the horizontal transfer portion is stopped that the resetting operation of the charge detection portion and the clamping operation of the OB clamping circuit are continued while the signal charges are stored in the photoelectric conversion region (Office Action, page 6, lines 14-21). However, the Examiner has argued that the Funakoshi publication teaches an OB clamping circuit 3 (Fig. 8) which clamps the optical black signal outputted from an optical black region of the CCD to a reference voltage [0050], the OB clamping circuit having a switch 15 (Fig. 9) which inputs the reference voltage from a reference power supply (Vcc, [0052], and that when signals are not being outputted, the OB acts as a feedback amplifier [0053], which the Examiner has interpreted to be equivalent to the resetting of the charge detection portion and clamping operation.

Applicant has reviewed the Funakoshi publication and respectfully disagrees with the Examiner's arguments. Specifically, Funakoshi discloses a solid state imaging device in which a CCD 1 output is input to an OB clamping circuit 3 and the output of the OB clamping circuit 3 is provided to a signal processing circuit, while a time signal circuit 5 supplies an optical black clamping pulse signal OBCP6 and an enable signal EN7 to the OB clamping circuit 3. See, FIG. 8. As shown in Fig. 9 of Funakoshi, the OB clamping circuit includes a standard clamping circuit and a feedback circuit, wherein the clamping circuit includes amplifiers 11 and 12, a switch 14, a low pass filter (R1 and C1) and a capacitor C3, and the feedback circuit includes an amplifier 13, switches 15 and 16 and a capacitor C2 (paragraph [0053], lines 1-12).

As shown in the timing chart of Fig. 10 of Funakoshi, when the CCD 1 provides an output signal (vertical period T), both the optical black clamping pulse signal OBCP6 and the enable signal EN7 are set high, thereby enabling switches 14 and 15 and providing a normal clamping function to the CCD 1 output signal (paragraph [0054], lines 7-11; paragraph [0056], lines 5-10). When the CCD 1 does not provide an output signal (vertical period S), both the optical black clamping pulse signal OBCP6 and an enable signal EN7 are set low thereby disabling switches 14 and 15, enabling switch 16 and applying a feedback loop to clamping circuit portion (paragraph [0054], lines 5-7; paragraph [0056], lines 3-5). This feedback loop modifies the clamping circuit portion of the OB clamping circuit 3 by changing the basis on which the output of the CCD 1 is clamped from the level of output signal of the OB clamping circuit to a level previously stored in the capacitor C2 (paragraph [0057], lines 1-9).

The Examiner has argued that "when signals are not being outputted the OB acts as a feedback amplifier which the Examiner interprets to be equivalent to the resetting of the charge detection portion and clamping operation." See Office Action page 7, lines 4-6. However, Funakoshi, teaches that when the CCD does not provide an output signal, the normal clamping operation on the output of the CCD based on feedback from the output signal of the OB clamping circuit is disabled, and instead a feedback loop based on a previously stored value in a capacitor is enabled. Therefore, Funakoshi does not teach that the clamping operation of the clamping circuit portion of the OB clamping circuit continues when the CCD does not provide and output signal, and the enabling of a feedback loop of the OB in Funakoshi is not equivalent to continuing the clamping operation or the resetting of the charge detection portion, as recited in applicant's independent claim 1.

Moreover, Funakoshi also does not disclose a charge detection portion and thus also does not, and cannot, disclose continuing resetting of the charge detection portion when the CCD does not provide an output signal and the signal charges are stored in the photoelectric conversion region. Instead, in Funakoshi, the CCD output is initially applied to a voltage amplifier (amplifier 12) of the OB clamping circuit, and Funakoshi is completely silent as to applying the CCD output to a charge detection portion either in the OB clamping circuit or anywhere else in the solid state imaging device. Therefore, there is no, and cannot be any, resetting of the charge detection portion in Funakoshi while the signal charges are stored in the photoelectric conversion region.

Accordingly, applicant's amended independent claim 1 which recites that the vertical transfer portion is driven with high-speed by providing that the vertical transfer pulse and the unnecessary charges generated in the vertical transfer portion are transferred to the horizontal transfer portion, providing the horizontal transfer pulse to the horizontal transfer portion is stopped, and the resetting operation of the charge detection portion and the clamping operation of the OB clamping circuit are continued while the signal charges are stored in the photoelectric conversion region, patentably distinguishes over the Wako patent and the Funakoshi publication, taken alone or in combination with one another. Moreover, the Kondo patent, which teaches that unnecessary charges are transferred into drain region only when the charges exceed a tolerance of the horizontal transfer portion, fails to add anything to the teachings of Wako and Funakoshi.

In view of the above, it is submitted that Applicant's claims, as amended, patentably distinguish over cited art of record. Accordingly, reconsideration and allowance of the application and claims is respectfully requested.

Dated: September 23, 2009

Respectfully submitted,

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